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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
08/748,935	11/13/9?	THAI	14385-32

		EXAMINER
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WASHINGTON DC 20005		

ART UNIT	PAPER NUMBER
2772	4

DATE MAILED: 05/26/99

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

X Responsive to communication(s) filed on _Nov 13, 1996_

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters,   **prosecution as to the merits is closed** in accordance with the practice under   *Ex parte Quayle,* 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire _____3_____ month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claim

X Claim(s) _1-22_____ is/are pending in the applicat

Of the above, claim(s) _____ is/are withdrawn from consideration

☐ Claim(s) _____ is/are allowed.

X Claim(s) _1-22_____ is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

X See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

X Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

   X All ☐Some*   ☐None   of the CERTIFIED copies of the priority documents have been

      X received.

      ☐ received in Application No. (Series Code/Serial Number) _____ .

      ☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   *Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☐ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

X Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

— SEE OFFICE ACTION ON THE FOLLOWING PAGES —

Part III DETAILED ACTION

1.   This action is responsive to communications: application, filed on 11/13/96; prior

art filed on 8/15/97; and priority paper filed on 1/20/97.

2.   Claims 1-22, including two claim 2s, are pending in the case. Claims 1, 2, 7, 8, 9,

13, 17, 21, and 22 are independent claims.

Claim Objections

The numbering of claims is not accordance with 37 CFR 1.126. The original numbering

of the claims must be preserved throughout the prosecution. When claims are canceled, the

remaining claims must not be renumbered. When claims are added, except when presented in

accordance.with 37 CFR 1.121(b), they must be renumbered consecutively beginning with the

number next following the highest numbered claims previously presented (whether entered or

not).

It appears theat the first claim 2 is a duplicate of claim one and should be deleted,

however, considering the state of the claims and specification Examiner has neither canceled the

first claim 2 or renumbered the remaining claims.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1-22 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The claimed invention relates to an abstract idea in the form of a mathematical algorithm for geometric modeling a representation of an object. Claims 1-8 are method claims and claims 9-22 are directed to an memory including means plus function elements for projecting and manipulating model elements. Because the model representation is not used to limit the claimed memory in any way or to achieve a physical conversion or independent physical act or even manipulate data representing a physical object in order to achieve a practical, the underlying method could not limit the memory structure itself but rather the memory merely stores and modifies the abstraction of a mathematical model of an object. At best one embodiment of the means plus function claims could relate to a computer implemented invention thereby falling under the guidelines for evaluating computer implemented inventions. As such once it determination is made that the invention does not transform the special purpose nature of the computing system into a special purpose computing system then the underlying method is evaluated to determine if the method is statutory under 35 USC 101. As noted above the method is not statutory.

Examiner recommends two modifications to the base claims, first expressly claim a

computer system for performing the method and second, recite a claim limitation which utilizes

the modified curves and lines in some practical application such as a CAM operation.

Claim Rejections - 35 USC § 112

Claims 1, 2, 7, 8, 9, 13, 17, 21, and 22 rejected under 35 U.S.C. 112, first paragraph, as

containing subject matter which was not described in the specification in such a way as to

reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application

was filed, had possession of the claimed invention.

Specifically the independent claims feature limitations directed to projecting the closed

curve and lines in order to modify the curved surface, which is represented by the curves and

lines, in three-dimensions. Examiner reminds Applicants that the projection of the curves and

lines is in two-dimensions and any modifications are made in the two-dimensional projection

plane. The third dimension, Z or depth, is with definition in the projection plane, therefore it is

impossible to accurately modify the line and curve group in the Z direction, much less accurately

modify the curves to fit a three-dimensional model which is **also** projected into two-space.

Claims 1, 2, 7, 8, 9, 13, 17, 21, and 22 are rejected under 35 U.S.C. 112, second

paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap

between the steps. See MPEP § 2173.05(l). The omitted steps are: modifying curves and lines in

three-space to contour a three-dimensional model when all are project into two-space.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness

rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims

under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was

commonly owned at the time any inventions covered therein were made absent any evidence to

the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor

and invention dates of each claim that was not commonly owned at the time a later invention was

made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35

U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-22 including two claim 2s are rejected under 35 U.S.C. 103(a) as being

unpatentable over Palm, U.S. Patent Number 5,742,291 (hereinafter Palm).

-Referring to independent claims 1, 2, 7, 8, 9, 13, 17, 21, and 22, the base invention

relates to a method and apparatus for representing a three-dimensional model as a set of

parametric equations. From the onset Examiner notes the creating three-dimensional model

representation of the three-dimensional objects is extremely well known as is the practice of using

either finite elements or parametric curves to represent the surface structure of the model.

Applicants have, however, modified this practice by preforming three-dimensional parametric

modeling operations on a form model. While the claims are not specific on this point, one use of

Application's invention might be to regain three-dimensional modeling resolution lost during finite

element generations or transformation.

For instance, a model of a sphere, see Applicant's **TM1** element, could be defined

geometrically as a radius r, a set of parametric equations defining a sphere having radius r, a solid

model having radius r or a closed surface set of finite elements, primitives, where the center of

each element is r distance from some point in three-space. While the finite element model seems

to be mathematically more cumbersome, given the nature of computer graphics the finite element

model is actually the model easiest to process into an image, or render. Therefore, the

conventional method of rendering a geometric model which is **not** described by finite elements is

to estimate the model with primitives. So parametric model surfaces are tesselated into an

number of primitives before the model can be displayed. The process is particularly burdensome

because finding the precise balance of primitive resolution, *i.e.* the number of primitives to

generate or tessellate, verses the resolution of the display and processing capabilities, requires a

number of geometric tests.

The most important of which is the flatness test. There a parametric curve or curved

surface is checked for the fit of the finite elements. Generally the vertices of the primitive lie on

the surface formed by the parametric curves so there is a gap between the parametric surface and the edges of the primitives. The midpoint between the vertices is generally the farthest distance away from the parametric surface and therefore the primitive flatness check is usually made at the midpoint. Once a sufficient number of primitives have been tesselated that the flatness gap is less than a predetermined value, the tessellation ceases and the finite element model is complete.

Geometrically speaking a finite element model has a resolution based on the number of primitive faces used to represent a curved surface. The parametric model on the other hand is considered to be resolution independent because the parametric surface generally depicts a realistic representation of the curved object at very high levels of detail. The resolution of finite element models are of course limited by the number of primitive needed to accurately represent the curved surface.

Essentially in one possible embodiment Applicants have reversed the above mentioned process by expressing a finite element model representation as a parametric representation. As representing a geometric model as either parametric surfaces or as finite elements was extremely well know at the time the invention was made and as converting one to the other was equally well known at the time the invention was made, reversing the process would also have been obvious to one of ordinary skill in the art at the time the invention was made in order to gain geometric resolution which was lost to the tessellation process but also because modeling applications available at the time the invention was made took advantage of the transportation time delays and user expected editing delays to update several model geometries simultaneously, such as solid

models and wire frame models which avoided long geometric conversions needed for the finished

model before applying lighting, materials, texture or rendering the model. However Applicant's

invention is directed to a specific method for achieving this result.

Essentially the curves and lines are transformed into the same space as the three-

dimensional form model, then both the form model and the curves and lines are projected in order

for the user to see a projection of the form model superimposed with the curves and lines. Finally

the user edits the position of the curves and lines by feature of the form model, thus moving the

curves and lines to overlay corresponding features and contours on the surface of the projection

of the form model. Palm obviates this process.

Palm discloses superimposing a projection of a closed wire frame onto the projection of an

object, then adjusting the location of features on the wire frame to the positions of corresponding

features on the projection of the object, thus forming an accurate representation parametric model

of the object. See column 2, line 55 to column 3, line 44 and column 7, line 28 to column 9, line

31. The difference between Palm and the present invention are minor, for instance Palm uses a

generic wire frame rather than horizontal closed curves and intersecting vertical lines. The

claimed wire frame configuration must initially form a cylindrical shape. While Palm does not

specifically disclose a cylindrically shaped wire frame, clearly the only shape more generic than a

cylinder is possibly a sphere. Regardless, it would have been obvious to one of ordinary skill in

the art at the time the invention was made to use a wire frame constructed of horizontal closed

curves and intersecting vertical lines because a cylinder is a generic shaped wire frame.

-Referring to independent claim 2, claim 2 is identical in scope to claim 1 discussed above, has similar feature limitations, and is rejected similarly under corresponding rationale.

-Referring to dependent claim 2, claim 2 depends from claim 1 above and incorporates the features of that claim. Additionally the present claim recites that the curves a parametric curves, which while not specifically recited as such, curves with movable vertices and segments are parametric, most probably NURBs because the control points or knots are on the curve itself, however other parametric curves were equally well known such as Bezier curve in which only the end point lie on the curve and the control point are off the curve in a position tangent to the curve where the curve intersects an end point.

-Referring to dependent claim 3, claim 3 depends from claim 1 above and incorporates the features of that claim. Additionally the present claim recites moving the control points causing the curve to move. Clearly Palm shows this feature by moving the vertices, see column 8, lines 42 - 59.

-Referring to dependent claim 4, claim 4 depends from claim 3 above and incorporates the features of that claim. Additionally the present claim recites a display, see column 7, lines 34-40.

-Referring to dependent claim 5, claim 5 depends from claim 1 above and incorporates the features of that claim. Additionally the present claim recites that the curve is a spline. The term 'spline' generally refers to any curve which is formed to fit a specific object feature, a broad term derived from the practice of using wooden splines to form the outline of a ship hull. All of the curves recited by Palm are spline curves.

-Referring to dependent claim 6, claim 6 depends from claim 5 above and incorporates the features of that claim. Additionally the present claim recites a display, see column 7, lines 34-40.

-Referring to dependent claim 7, claim 7 is similar in scope to claim 1 discussed above, has similar feature limitations, and is rejected similarly under corresponding rationale. Additionally claim 7 recites adding a line, see column 9, lines 8-30 where adding a vertex includes the adjoining line.

-Referring to dependent claim 8, claim 8 is similar in scope to claim 1 discussed above, has similar feature limitations, and is rejected similarly under corresponding rationale. Additionally claim 8 recites deleting a line, see column 8, line 59 to column 9, line 7 where deleting the vertex includes the deleting the adjoining line.

Apparatus claim 9 is similar in scope to method claim 1, has corresponding limitations and is therefore rejected similarly using corresponding rationale.
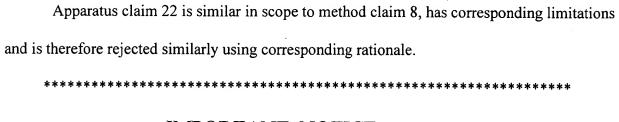
-Referring to dependent claims 10-12, 14-16 and 18 - 20 includes different memories common to any computer.

Apparatus claim 13 is similar in scope to method claim 7, has corresponding limitations and is therefore rejected similarly using corresponding rationale.

Apparatus claim 17 is similar in scope to method claim 8, has corresponding limitations and is therefore rejected similarly using corresponding rationale.

Apparatus claim 21 is similar in scope to method claim 7, has corresponding limitations

and is therefore rejected similarly using corresponding rationale.

Apparatus claim 22 is similar in scope to method claim 8, has corresponding limitations

and is therefore rejected similarly using corresponding rationale.

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IMPORTANT NOTICE

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Effective November 16, 1997, the Examiner handling this application will be assigned to a new Art Unit as a result of the consolidation into Technology Center 2700. See the forth coming Official Gazette notice dated November 11, 1997. For any written or facsimile communication submitted ON OR AFTER November 16,1997, this Examiner, who was assigned to **Art Unit 2412**, will be assigned to **Art Unit 2772**. Please include the new Art Unit in the caption or heading of any communication submitted after the November 16,1997 date. Your cooperation in this matter will assist in the timely processing of the submission and is appreciated by the Office.

Conclusion

3.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rudolph J. Buchel Jr. whose telephone number is (703).305-9591. The examiner can normally be reached on Monday - Thursday from 6:30 AM - 5:00 PM.

If attempts to reach the examiner are unsuccessful, the examiner's supervisor, Heather Herndon, can be reached on (703) 305-9701.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 305-3900.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks
Washington, D.C. 20231

or faxed to:

(703) 308-9051, (for formal communications intended for entry)

Or:

(703) 305-9724(for informal or draft communications, please label "PROPOSED" or "DRAFT")

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington. VA., Sixth Floor (Receptionist).

Rudolph J. Buchel Jr.
Patent Examiner
Art Unit 2772
May 22, 1998